DOCUMENT RESUME

ED 042 493 PS 003 324

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TITLE	Social Facilitation of Head Start Performance. Progress Report.
INSTITUTION	Kansas Univ., Lawrence. Head Start Evaluation and Research Center.
SPONS AGENCY	Office of Economic Opportunity, Washington, D.C.
REPORT NO	KU-HSERC-TR-10
PUB DATE	Aug 69
NOTE	18p.
EDRS PRICE	EDRS Price MF-$0.25 HC-$1.00
DESCRIPTORS	Culturally Disadvantaged, *Motivation, *Peer Relationship, Performance Factors, Preschool Children, *Social Adjustment, Task Performance
IDENTIFIERS	*Head Start

ABSTRACT

A study was designed to test the effects of the presence of age-mates on the preacademic performance of socially unresponsive, disadvantaged preschool children. Each of four low performing male subjects was confronted with three high performing male and three low performing male peers. Of the peers in each of the two performance groups, one was from a middle class preschool, one from a different lower class preschool, and one from the subject's lower class preschool. The subject went through a match-to-sample discrimination task session with each of his 6 peers. All of these sessions included 4 conditions: (1) baseline alone with experimenter, (2) observed by peer, (3) competing with peer, and (4) final baseline. Results showed that the subjects deteriorated in performance compared to baseline when familar peers observed, but that their performance improved when they competed with low performing familiar peers. Subjects' performance in the observation phase was only superior to baseline when the observer was a middle class high performer. The small sample size, however, renders any generalizations from these results highly speculative (MH)

TECHNICAL REPORT

RESEARCH

Report No. 10

UNIVERSITY OF KANSAS

HEAD START EVALUATION AND RESEARCH CENTER

University of Kansas, Lawrence, Kansas

The research reported herein was performed, inpart, pursuant to a contract with the Office of Economic Opportunity, Executive Office of the President, Washington, D. C. 20506. The opinions expressed herein are those of the author(s) and should not be construed as representing the opinions or policy of any agency of the United States Government.

SOCIAL FACILITATION OF HEAD START PERFORMANCE

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ABSTRACT

In previous studies by the investigator it was found that the social responsiveness of typically passive preschool children from low income families was greatly accelerated when certain age-mates were present. The present study was designed to test the effects on preacademic performance by such subjects of three categories of age-mates which were confounded in the earlier studies. Each of four male low performing subjects--two from each of two schools--was confronted with six male peers--three low and three high performers. In each of the two sets of peer performers, one peer was from a middle income preschool, one from a different low income preschool, and one from the subject's own low income preschool. In each of his six sessions the subject performed on a match-to-sample letter-like-form discrimination task under four conditions: (1) a baseline while alone with the experimenter, (2) observed by his peer, (3) in competition with the peer, and (4) a final baseline alone. All subjects deteriorated in performance compared to baseline when familiar peers were introduced as observers. However the subjects' performance improved when the low performing peer from the above group competed with them. The only peer to lead to an increase in the subjects' performance in the observation phase was the middle income high performer. Thus the "social facilitation" effect of the presence of peers on the responsiveness of low income preschool children was primarily a function of familiarity, while relative performance skills of subject and peer was effective in competitive conditions. Economic background in itself had no consistent effects on performance in any condition.

INTRODUCTION

The present project was stimulated by the results of two earlier studies concerned with the performance of low income (Head Start) preschool children in different social circumstances. The two previous studies indicated that peers can exert powerful effects on the verbal and conceptual-motor performance of children who appear incompetent in other social circumstances. In the first study (Horowitz and Rosenfeld, 1966), a Head Start child who was chronically verbally nonresponsive in the presence of teachers and other nonfamilial adults was subsequently induced to display quite extensive and complex verbal performances merely by the introduction of his preferred school playmate into the laboratory. In the second study (Rosenfeld and Russell, 1967) follow up research was done on two Head Start children who were repeatedly extremely low performers in competitive and cooperative tasks when paired with typical members of

a middle income preschool. By pairing the Head Start peers with each other, their performances improved dramatically. In all of these cases, the facilitation of performance was partially or totally reversible by the removal of the Head Start peer.

While the above examples clearly indicated that the Head Start peers exerted significant effects upon the performances of the Head Start subjects, they did not permit an unconfounded identification of the responsible mechanisms of influence. In fact to maximize the likelihood of obtaining a peer effect in the second study, several variables were purposely varied simultaneously. The Head Start peers, in contrast to the middle income peers, were more familiar to the subjects and were closer in baseline performance levels to them. Additional possible confounding variables were whatever features and mannerisms might differentiate low and middle income children in addition to rate of performance. The present study was designed to unconfound these possibilities, thereby to determine which peer characteristics can account for variations in the performances of children from low income families.

METHOD

Task

A task was sought which required preacademic performance skills and which was likely to be sensitive to motivational variations within subjects. Such a task was adapted from the letter-like forms employed by Gibson, Gibson, Pick and Osser (1962) in their normative studies of perceptual discrimination in young children. The stimuli, including numerous variants constructed and pretested for the current project, were arranged in the form of four-choice match-to-sample problems, presentable on an MTA (Modern Teaching Associates) Scholar apparatus.[1] This programmable apparatus permitted a series of seventy frames, attached to a continuous length of standard program paper, to be loaded at one time. Each frame consisted in a single sample stimulus presented beneath the center of the upper portion of a transparent window, and four possible matching stimuli lined up horizontally below--one of which was identical to the sample. The frames were constructed in blocks of ten, each containing stimuli randomly selected from each of four levels of difficulty, as indicated by published age-norms and our own pretests. Variants of stimulus patterns consisted in reversals, rotations, and curve-to-line ratios. A total of seven hundred stimuli was constructed to meet the requirements of the study.

To perform the task, the subject was required to press the window over the one stimulus in the match set that was the same as the sample stimulus. Equipment interfaced to the apparatus included a bell and a rather aversive sounding buzzer--at least to adults. If the subject pressed the window above the correct matching stimulus a momentary ring of the bell and the next frame were automatically presented. Each pressing of

an incorrect window produced only a momentary buzz. If the correct window was pushed after one or more incorrect ones, the next frame occurred but no bell. Of course the functions of the bell and buzzer as indicators of right and wrong responses were carefully explained to each subject.

Frequencies of first correct responses and frequencies of errors were automatically accumulated on counters. After each tenth consecutive stimulus frame the apparatus presented a blank frame and was rendered temporarily inoperable while the experimenter assessed the performance in the preceding block. A record also was kept of the time it required for the subject to complete each block of ten stimuli.

Selection of Subjects and Peers

The study required that age mates of the subjects vary independently along three dimensions: (1) familial income level (lower and middle), (2) baseline performance level (low and high), and (3) familiarity with the subjects (unfamiliar and familiar). Subjects were to be selected from low income (Head Start) preschools and were to display low baseline performance levels.

The design called for an intensive study of a small number of subjects each exposed to all stimulus conditions, rather than the more typically employed larger sample with independent subject groups nested within each condition. Subjects were selected from three available summer preschools--two with children from lower income groups and the other composed primarily of children from middle income backgrounds.[2] The schools were located in different sections of town, thereby assuring a lack of acquaintance in general between their respective inhabitants.

All available children enrolled in morning sessions were pretested on the task by trained assistants working with them individually in private rooms in their respective schools. After careful semi-programmed instructions were given, each child performed two blocks of ten responses on the match-to-sample task. On the basis of stable low performances, two children from each low income preschool were designated subjects. Two additional children were selected from each of the low income preschools, and two more from the middle income preschool to serve as peers (partners) for each of the four subjects. One peer from each group was, like the subjects, a low performer on the pretest (defined as getting approximately a random twenty-five percent correct in each block of trials), and the other peer was a high performer (over fifty percent correct). Other children who met the criteria to serve as subjects or peers were listed as substitutes in case the designated persons were unable to serve or later failed to maintain the performance criteria for which they were selected. The performances upon which the four subjects and six peers were selected are shown in Table 1. Subject availability plus the fact that only males

INSERT TABLE 1 ABOUT HERE

were included in the previous studies that led to the present experiment were responsible for the decision to include only boys in the present study. The children selected as subjects ranged in age from four years two months to five years five months.

Settings and Logistics of the Experiment

The experiment proper was conducted in the investigator's social behavior laboratory at the Bureau of Child Research in Lawrence, Kansas. Arrangements were made for a female assistant to accompany two subjects and two peers by taxicab between their respective preschools and the laboratory four mornings per week over a three week period. Each subject was assigned one peer, permitting two sessions per morning. This allowed each of the four subjects to be paired with each of the six peers. The order of pairings was made as randomly as possible, given the logistics problems of rapidly collecting and transporting subjects scattered throughout town. Any cumulative effects on subjects were detectable by the assessment of baseline performances at the beginning and end of each session. When subjects arrived at the laboratory, all four were brought into a playroom by the assistant who accompanied them. The experimenter called for specific subjects and peers by means of an intercom from the nearby laboratory room.

Experimental Design

Each subject was paired with a different peer on six different days. As Table 1 indicates, three of the six peers were low performers and three were high. At each performance level, one low income peer was familiar to the subject (i.e., from the same school), and the other low income peer was unfamiliar (from the other school). It was unavoidable that the middle income peer at each performance level had to be unfamiliar to the subject. (One might argue that repeated presentations of a middle income peer with a subject would make them familiar; however, the previous study by Rosenfeld and Russell, 1967, indicated no such effects on performance after three identical pairings over a three week period.)

Within each subject-session, the subject was exposed to four standard treatments, always in the same order:

(1) Baseline 1: The subject performed two blocks of ten trials with only the experimenter present.

(2) Observation: The peer was brought into the laboratory room and seated beside the subject for the ostensible purpose of watching the subject perform. The phase consisted in two more blocks of ten trials.

(3) Competition: The peer performed the task for ten trials with the subject watching; then the subject performed with the peer watching. The winner of the ten-trial block selected a prize from a box of

trinkets. The criterion of winning was, first, more correct responses (on the first push of a response button). If a tie occurred the criterion shifted to fewer errors. If there was still a tie, the criterion shifted to less time for completion of the ten trials. The subject and peer went through four rounds of competition.

(4) Baseline II: The peer was removed from the room and the subject performed two more blocks of ten trials.

For purposes of the present analysis, each session was considered to comprise five consecutive phases for the subject: a twenty-trial Baseline I, a twenty-trial Observation period, twenty trials of Competition I (two rounds), twenty trials of Competition II, and finally a twenty-trial Baseline II (see Figures 1 through 4). Note that in addition to the above one hundred trials of the subject, the peer also went through forty trials during the competitive period. These one hundred forty presentations for each of six sessions per subject required a total of seven hundred frames so that each subject could have at least topographically (though not functionally) unique stimuli across the sessions.

Additional Records

It was considered desirable to maintain complete records of experimental sessions for later detailed checking for possible experimenter biases, for demonstrating procedures exactly, and particularly for searching for characteristics of subject and peer behavior that could account for any peer effects obtained. Thus a sample of sessions was recorded on videotape through a one-way window.[3]

RESULTS AND DISCUSSION

Validation of Peer Performance Designations

To determine the effect of relative performance level of peers on the performance of subjects it was essential that peers designated "low" and "high" performers in the pretests maintain their initial performance levels in subsequent competition with the subjects. The validity of the initial designations was determined by comparing them to the actual later competitive performances. These comparisons are presented in Table 2. Three criteria of performance were employed--number of correct and erroneous responses during competition, and number of competitive rounds won. Each criterion was averaged across the four subjects encountered by each peer, for purposes of this validation.

INSERT TABLE 2 ABOUT HERE

The validity of the assumption that the relative pretest performance levels of the "low" and "high" peers would carry over into the later competitive conditions was strongly supported. There was absolutely no overlap in any of the distributions of individual peer scores across any of the three competitive performance criteria. Peers designated "low" performers obtained approximately one-third correct responses on the match-to-sample task, while those labeled "high" performers responded correctly on over three-fourths of the stimulus presentations. (Again, random performance would have provided about twenty-five percent correct responses.)

The difference between "low" and "high" peers was similarly reflected in error scores. The "lows" scored approximately four times as many errors as the "highs". It should be noted that errors tend to be negatively correlated with correct responses, but not necessarily to a strong degree. If a child makes an error in response to a stimulus presentation, then he cannot receive a correct response on that trial; conversely, if he initially responds correctly he cannot make an error on that trial. However, if he makes an initial error, theoretically there is no limit to the number of subsequent errors he can make. In practice however the subject who makes numerous errors usually is one who responds, apparently at random, to one match-window after another. In this case, he makes no more than three errors per trial, and usually less. An occasional subject, however, responds to an error by repeated tapping of the same key. In such cases, the experimenter would terminate the repetition by advancing the next stimulus frame, although no exact criteria were set or followed for this rule. It was considered proper to set these limits on errors for two statistical reasons: first, to prevent a highly irregular distribution of scores across treatments, sessions, and subjects; and second, to reduce the probability that the performance of an error would, in itself, increase the probability of performing a subsequent error. The latter consideration is important in the employment of single subject statistics across trials, in which the assumption typically is required that each response is independent of the nature of the preceding response (and dependent, instead, on the experimental treatment employed). Although a proper sampling statistical technique has not yet been constructed to fit the properties of the current single-subject data, the above limitations on errors should lessen the problem.

Finally, the difference between the low and high peer performers in number of ten-stimulus rounds won in competition with the peers indicates that the performance differentials required by the design of the study should have been apparent to the subjects. The low performing peers won from one-fifth to one-half of their rounds, while the high performing peers won virtually all of their rounds.

Experimental Effects

Although the study was designed for a replicated single subject analysis, treatment effects are averaged across subjects in Figures 1 and 2 to reveal

some general trends. For the interpretation of experimental effects, however, only reasonably strong trends that were common to at least three of the four subjects were considered.

INSERT FIGURES 1 AND 2 ABOUT HERE

The individual data reported in Figures 3 and 4 indicated one dominant effect of treatments: the introduction of a familiar peer as an observer clearly resulted in a decrement in performance of the subject. Figure 3 shows that every subject confronted by a familiar peer performed fewer correct responses than in the antecedant baseline. Relatedly, Figure 4 shows that all subjects increased their errors over baseline when their familiar peers were presented.

INSERT FIGURES 3 AND 4 ABOUT HERE

The effect of familiar observers was essentially independent of the performance levels of the peers. This makes sense, of course, given that there was no opportunity for the peers to perform on the match-to-sample task during the observation phase. But it does indicate that peers who differed in skill on the task did not also differ in passive or active characteristics outside of the performance role--at least in any functional sense. The individual data also failed to reveal any consistent effects of income classification of peers in the observation phase.

INSERT TABLE 3 ABOUT HERE

The averaged effects of familiar observers on subject performance are numerically summarized in Table 3. One additional finding in the observation period should be added to the dominant effect of familiarity. The one peer who facilitated correct responses in every subject in the observation period was the high performer from the middle income preschool (not shown on figures of individual data). Of course, given that only one peer represented this category, any generalizations to the population from which he was drawn must be highly speculative.

In any case, the videotaped records of the middle income high-performing peer and the familiar peers in the observation phase revealed some apparently characteristic behaviors. In the presence of observers--especially familiar ones--subjects frequently glanced away from their apparatus and toward the face of their peer. Typically this resulted in eye contact. The subject then would often engage in what might be described as task-irrelevant facial "mugging", sometimes accompanied by nonlinguistic vocalizations.

When the peer was familiar he would typically reciprocate these muggings and sounds, or at least provide other social cues that appeared to be reinforcing. These distractive behaviors tended to increase in rate and intensity and would be interspersed with the subject's performances on the task. Occasionally, the subject and peer would work themselves into such a frenzied state that the experimenter would have to intervene, and in one case (the subject with missing data in Tables 3 and 4) the experiment had to be terminated early, due to the subject and peer alternating in turning off the lights in the experimental room. Such disruption, however, was rare; a more typical response of the subject was to hit error keys at a rapid rate, thereby producing a volley of sharp buzzes, much to the apparent delight of subject and peer.

When paired with the middle income high performing peer, on the other hand, the subject's distractive responses rarely had any effect on the peer. The apparent consequence of this nonreciprocation was an increased attention to the task by the subject. Given that the subject typically had prior exposure to other peers, perhaps the serious middle income high performer's behavior in the observation period was discriminative for impending competitive defeat for the subject in the forthcoming competitive phase.

The only peers displaying any generally consistent effects on subject performance in the competitive phase were the low income low performers. The effects differed as a function of the peer's familiarity with the subjects. As shown in Figures 3 and 4, the low income low performing unfamiliar peers in the competitive phase led in general to a decrement in subject performance in terms of both correct and erroneous responses. This effect is particularly evident when compared to the subjects' initial baseline performance levels. In contrast, the low income, low performing familiar peers were the only group to facilitate the performance of subjects in the competition phase. These results also are displayed in Figures 3 and 4. The only exception was Subject 4, who for nonobvious reasons got beaten in all four competitive rounds by his supposedly "low performing" peer. As Figure 4 indicates, this continuous beating was associated with an exceptionally large increase in errors by Subject 4.

When the subjects were in the above familiar-peer condition, it thus appeared that competition had a "sobering" effect upon their performance, which had deteriorated in the preceding observation periods; while subjects with the unfamiliar peer either began their deterioration at this point, or else continued performance decrements initiated in the observation period. Considering both the observation and competition periods, then, it would appear that there is a general "facilitation" effect of familiar peers when they are apparent equals of the subject. While observed by these peers, the subject induces reciprocal stimulation of task-irrelevant behaviors--the only responses accessible to both peer and subject at that time. Limiting the principle that social cues enhance dominant responses

(Zajonc, 1968) to familiar social cues in this case, one could argue that for low performing subjects (and peers), task-irrelevant behaviors may indeed be dominant responses. The acceleration of errors by subjects in this condition also fits that interpretation. The same subjects in the competitive phase, however, face an additional consideration. Those familiar peers who happen to perform well now spoil the task-irrelevant game by winning the competitive rounds and the prizes that follow. If these peers are chronically low performers, the subjects are capable of beating them through serious effort. However, the chronically high performing peers are sufficiently superior to punish competitive efforts by the subjects. The low income low performing peers who are unfamiliar simply lack the facilitating effect. The explanation of the obtained differences in performance as due to familiarity must in itself be explained in terms of the history of interaction between subjects and familiar peers. The present study has functioned to raise this problem but was not designed to answer it.

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FOOTNOTES

[1]An attempt was made to construct a more flexible apparatus, but it could not be completed in time for employment in the present study. Further information about the intended apparatus may be obtained from the principal investigator. We are grateful to Dr. Barbara Etzel for sharing with us the MTA Scholar that she was using in her own research.

[2]The investigators appreciate the willing and helpful assistance provided by the staff members of the preschools from which subjects were recruited

[3]Video-taping equipment was provided by the Bureau of Child Research.

Table 1

PRETEST PERFORMANCES OF CHILDREN
LATER DESIGNATED SUBJECTS (S) AND PARTNERS (P)

Identification of Performers			Responses to Twenty Stimulus Presentations	
Role	School	Performance Designation	Correct	Errors
Subjects				
S_1	LI-B	Low	10	20
S_2	LI-B	Low	3	29
S_3	LI-P	Low	8	30
S_4	LI-P	Low	5	18
(Mean of Subjects)			6.5	23.0
Partners				
P_1	LI-B	Low	6	50
P_2	LI-P	Low	6	36
P_3	MI	Low	4	31
(Mean of Low Partners)			5.3	39.0
P_4	LI-B	High	13	14
P_5	LI-P	High	19	1
*P_6	MI	High	16	7
(Mean of High Partners)			16.0	5.5

*Substitute selected later by reputation. Pretest performance here estimated from first competitive performance.

Table 2

COMPETITIVE PERFORMANCES OF PARTNERS
WHO HAD "LOW" AND "HIGH" PRETEST SCORES

	Mean Competitive Performance		
	40 Stimulus Presentations		4 10-Stimulus Rounds
Pretest Performance	Correct	Errors	Wins
Low			
$\underline{P}_1$	11.6	110.0	0.8
$\underline{P}_2$	17.4	55.8	2.0
$\underline{P}_3$	14.0	72.6	0.8
(Mean Lows)	14.3	79.5	1.2
High			
$\underline{P}_4$	27.4	33.4	3.7
$\underline{P}_5$	35.2	10.2	4.0
$\underline{P}_6$	34.4	10.8	4.0
(Mean Highs)	32.3	18.2	3.9

Table 3

EFFECT OF FAMILIARITY OF OBSERVER
ON PERFORMANCE OF SUBJECTS

Period	Observer: Unfamiliar	Observer: Familiar
	Mean Correct	
Observation (O)	10.5	8.8
Baseline I (B_I)	10.7	11.5
$O-B_I$	- 0.2	- 2.7
	Mean Errors	
Observation (O)	23.1	32.2
Baseline I (B_I)	21.7	18.9
$O-B_I$	+ 1.4	+13.3
	Mean Errors - Correct	
Observation (O)	12.1	23.4
Baseline I (B_I)	11.0	7.4
$O-B_I$	+ 1.1	+16.0

Figure 1.--Correct Responses of Grouped Subjects as a Function of Experimental Period and Characteristics of Partner

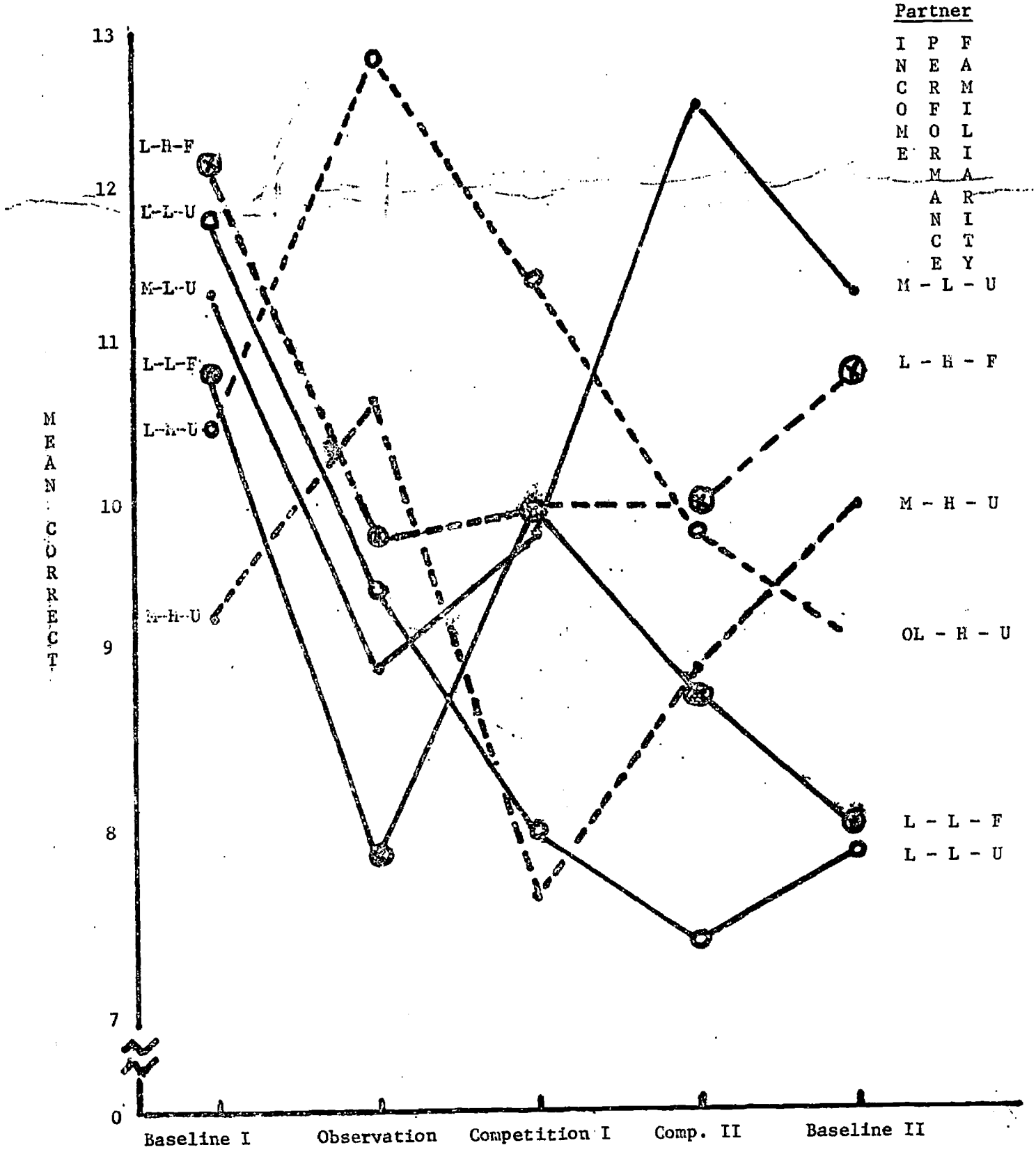

Figure 2.--Erroneous Responses of Grouped Subjects as a Function of Experimental Period and Characteristics of Partner

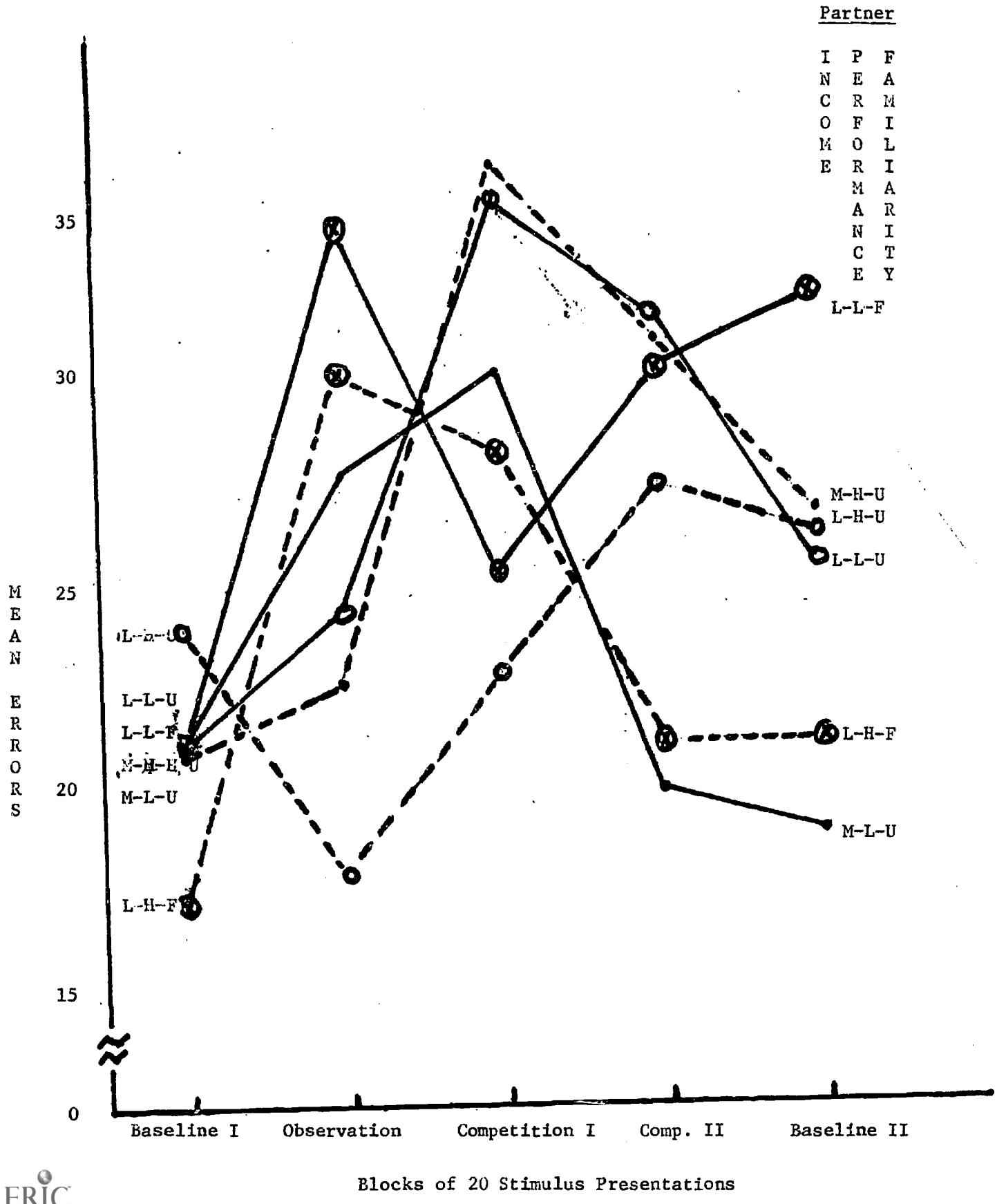

Figure 3.--Correct Responses of Single Subjects with Three of the Partners.

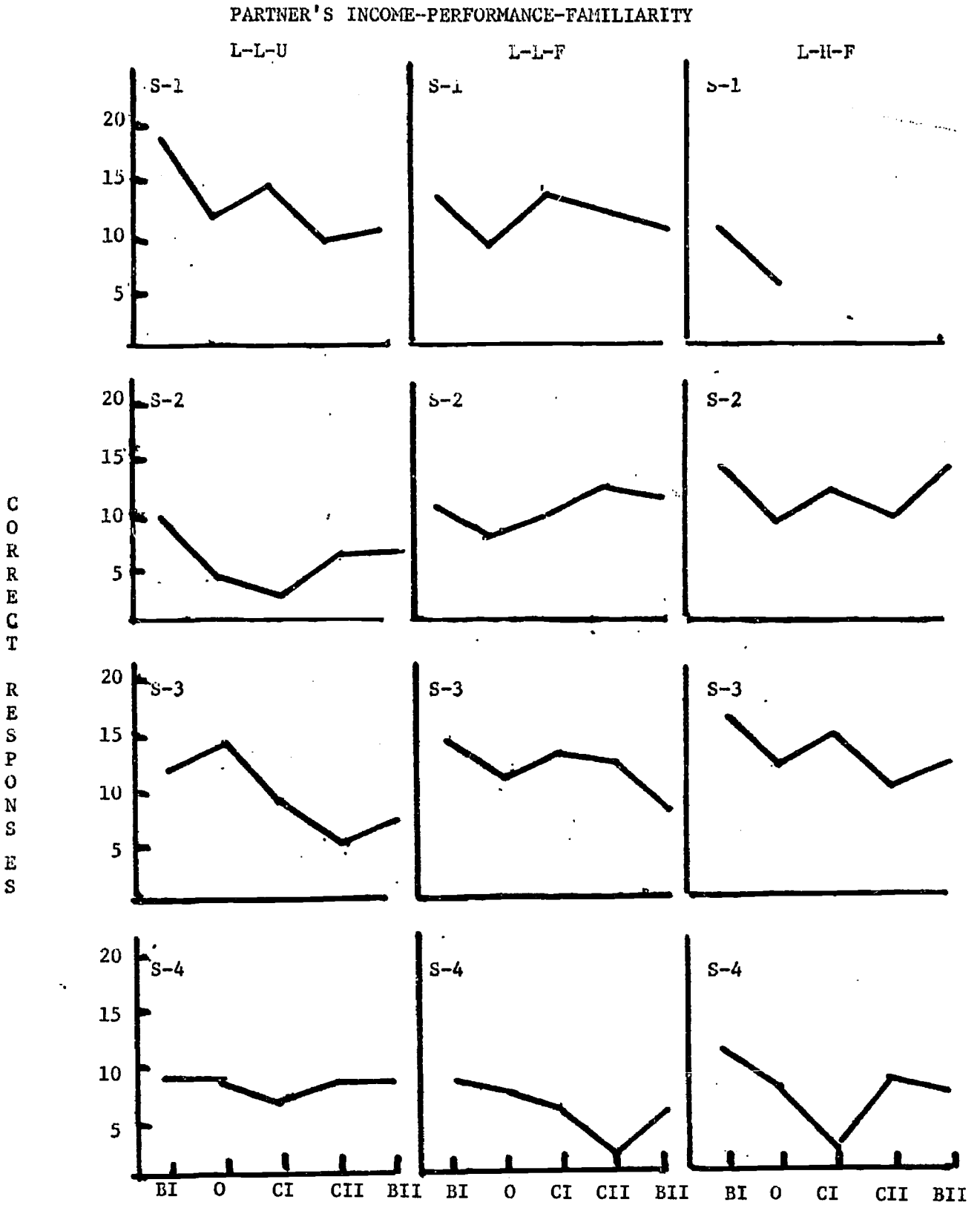

Figure 4.--Erroneous Responses of Single Subjects with Three of the Partners.